

IN THE CLAIMS

1. A ~~[[D]]~~die set for forming cartridge cases (1;101) from a sheet, comprising at least three support elements, respectively an upper element (1100), middle element (1200) and bottom element (1300), ~~characterized in that~~ wherein they are connected together in the longitudinal direction by guide columns (1001) along which said upper support (1100) and bottom support (1300) are actuated displaceably relative to each other in predefined working sequences, in that said upper support element (1100) and bottom support element (1300) are movable relative to the fixed middle element (1200) and in that said middle support element (1200) comprises means (1230) for shearing and means (1240) for forming the case (1;100) able to co-operate with corresponding locating means (1330,1340) associated with said bottom support element (1300).

2. A ~~[[D]]~~die set according to Claim 1, ~~characterized in that~~ wherein said means (1230) for shearing and means (1240) for forming the case (1;101) comprise a sleeve (1210) extending in the axial direction and constrained to the middle support element by means of internally threaded elements (1211) suitable for mating with the threaded opposite ends (1210a) of the said sleeve.

3. A ~~[[D]]~~die set according to Claim 1, ~~characterized in that~~ wherein said means (1230) for shearing and means (1240) for forming the case (1;101) comprise a blanking punch (1230) arranged inside the sleeve (1210) and coaxially arranged so as to extend outside the side of the middle support element (1200) directed towards the bottom element (1300).

4. A ~~[[D]]~~die set according to Claim 3, ~~characterized in that~~ wherein the opposite ends of said blanking punch (1230) are respectively locked inside said sleeve (1210) and axially project towards the outside of the middle support element.

5. A [[D]]die set according to Claim 2, ~~characterized in that~~ wherein said sleeve (1210) has, arranged coaxially inside it, a containing bush (1220) housing internally an adjustable-load spring (1221), the opposite ends of which bear respectively against a closing element (1222) and against the said blanking punch (1230).

6. A [[D]]die set according to Claim 1, ~~characterized in that~~ wherein said forming means comprise a drawing punch (1240) integral with one end of a rod (1241), the opposite end of which is integrally fixed to the upper support element (1100) with the arrangement of a spring (1243) in between.

7. A [[D]]die set according to Claim 6, ~~characterized in that~~ wherein said rod (1241) has passing through it axially a duct (1242) for supplying air to the drawing punch (1240).

8. A [[D]]die according to Claim 6, ~~characterized in that~~ wherein said rod (1241) passes coaxially through the closing element (1222) and the spring (1221).

9. A [[D]]die set according to Claim 6, ~~characterized in that~~ wherein the end part of the drawing punch (1240) directed towards the top part of the die set has a seat (1245a) able to contain a shearing ring (1245).

10. A [[D]]die set according to Claim 6, ~~characterized in that~~ wherein the end part of the blanking punch (1240) has an axial seat (1241) able to contain the boring tip (1353).

11. A [[D]]die set according to Claim 1, ~~characterized in that~~ wherein the bottom support element (1300) has, inserted inside it, a shearing die (1330).

12. A [[D]]die set according to Claim 11, ~~characterized in that~~ wherein the bottom support element (1300) has, inserted inside it, a drawing die (1340) coaxial with said shearing die (1330).

13. A [[D]]die set according to Claim 1, ~~characterized in that~~ wherein the bottom support element (1300) has, inserted inside it, an extractor (1360).

14. A [[D]]die set according to Claim 1, ~~characterized in that~~ wherein the bottom support element (1300) has, inserted inside it, a boring punch (1350).

15. A [[D]]die set according to Claim 11, ~~characterized in that~~ wherein the shearing die (1330) is axially fixed to the bottom support element (1300).

16. A [[D]]die set according to Claim 12, ~~characterized in that~~ wherein the drawing die (1340) is axially fixed to the bottom support element (1300).

17. A [[D]]die set according to Claim 14, ~~characterized in that~~ wherein the boring punch (1350) is axially fixed to the bottom support element (1300).

18. A [[D]]die set according to Claim 13, ~~characterized in that~~ wherein said extractor (1360) comprises a cup member (1361) movable axially against the thrusting action of spring means (1362).

19. A [[D]]die set according to Claim 17, ~~characterized in that~~ wherein said cup member (1361) has a coaxial opening (1361a) able to allow means (1350) for boring the case (1;101) to pass through.

20. A [[D]]die set according to Claim 14, ~~characterized in that~~ wherein said boring punch (1350) comprises a tip (1353) integral with the top end of a column (1352).

21. A [[D]]die set according to Claim 21, ~~characterized in that~~ wherein the boring punch (1352) comprises an annular surface (1370) arranged coaxially with the said punch and at a suitable axial distance from the boring tip (1353), the said annular surface being provided with reliefs (1371,1372) for engraving the bottom of the case (1;101).

22. A [[D]]die set according to Claim 21, ~~characterized in that~~ wherein the forming punch (1240) envisages a free surface for making contact with the disk [[10]], associated with a surface (1270) on which recesses (1271,1272) corresponding to the reliefs (1371,1372) on the annular engraving surface (1370) are formed.

23. A [[D]]die set according to Claim 1, ~~characterized in that~~ wherein it comprises an element (1310) for axially closing the seat housing the said boring means (1350).

24. A [[D]]die set according to Claim 1, ~~characterized in that~~ wherein said case [[101]] has a surface graphically pre-printed in one or more colours.

25. A [[M]]machine for forming a case (1;101) from a sheet, comprising a die set comprising at least three support elements, respectively upper element (1100), middle element (1200) and bottom element (1300), ~~characterized in that~~ wherein they are connected together in the longitudinal direction by guide columns (1001) and/or by sliding surfaces along which said upper support element (1100), middle support element (1200) and bottom support element (1300) are actuated displaceably relative to each other in predefined working sequences, in that said middle support element (1200) is fixed and in that said middle support element (1200) comprises shearing means (1230) and drawing punch (1240) for forming the case (1;101), able to co-operate with corresponding means (1330,1340) associated with said bottom support element (1300).

26. A [[M]]machine according to Claim 25, ~~characterized in that~~ wherein it is a press.

27. A [[M]]machine according to Claim 25, ~~characterized in that~~ wherein said shearing means (1230) and means (1240) for forming the case (1;101) comprise a sleeve (1210) extending in the axial direction and constrained to the middle support element by means of

internally threaded elements (1211) suitable for mating with the threaded opposite ends (1210a) of the said sleeve.

28. A [[M]]machine according to Claim 25, ~~characterized in that~~ wherein said means (1230) for shearing and means (1240) for forming the case (1;101) comprise a blanking punch (1230) arranged inside the sleeve (1210) and coaxially arranged so as to extend outside the side of the middle support element (1200) directed towards the bottom element (1300).

29. A [[M]]machine according to Claim 27, ~~characterized in that~~ wherein the opposite ends of said blanking punch (1230) are respectively locked inside said sleeve (1210) and axially project towards the outside of the middle support element.

30. A [[M]]machine according to Claim 26, ~~characterized in that~~ wherein said sleeve (1210) has, arranged coaxially inside it, a containing bush (1220) housing internally an spring (1221), the opposite ends of which bear respectively against a closing element (1222) and against said blanking punch (1230).

31. A [[M]]machine according to Claim 25, ~~characterized in that~~ wherein said forming means comprise a drawing punch (1240) integral with one end of a rod (1241), the opposite end of which is integrally joined to the upper support element (1100) with the arrangement of a spring (1243) in between.

32. A [[M]]machine according to Claim 30, ~~characterized in that~~ wherein said rod (1241) has passing through it axially a duct (1242) for supplying air to the drawing punch (1240).

33. A [[M]]machine according to Claim 30, ~~characterized in that~~ wherein said rod (1241) passes coaxially through the closing element (1222) and the spring (1221).

34. A ~~[[M]]~~ machine according to Claim 30, ~~characterized in that~~ wherein the end part of the drawing punch (1240) directed towards the inside of the middle support element (1200) has a seat (1245a) able to contain a shearing ring (1245).

35. A ~~[[M]]~~ machine according to Claim 30, ~~characterized in that~~ wherein the end part of the drawing punch (1240) directed towards the upper support of the die set has a seat (1241) able to contain the tip (1353) of the boring punch (1352).

36. A ~~[[M]]~~ machine according to Claim 25, ~~characterized in that~~ wherein the bottom support element (1300) has, inserted inside it, a shearing die (1330).

37. A ~~[[M]]~~ machine according to Claim 25, ~~characterized in that~~ wherein the bottom support element (1300) has, inserted inside it, a drawing die (1340) coaxial with said shearing die (1330).

38. A ~~[[M]]~~ machine according to Claim 25, ~~characterized in that~~ wherein the bottom support element (1300) has, inserted inside it, an extractor.

39. A ~~[[M]]~~ machine according to Claim 25, ~~characterized in that~~ wherein the bottom support element (1300) has, inserted inside it, a boring punch (1350).

40. A ~~[[M]]~~ machine according to Claim 35, ~~characterized in that~~ wherein the shearing die (1330) is axially fixed to the bottom support element (1300).

41. A ~~[[M]]~~ machine according to Claim 36, ~~characterized in that~~ wherein the drawing die (1340) is axially fixed to the bottom support element (1300).

42. A ~~[[M]]~~ machine according to Claim 39, ~~characterized in that~~ wherein the boring punch (1350) is axially fixed to the bottom support element (1300).

43. A [[M]]machine according to Claim 37, ~~characterized in that~~ wherein said extractor (1360) is formed by a cup member (1361) movable axially against the thrusting action of spring means (1362).

44. A [[M]]machine according to Claim 42, ~~characterized in that~~ wherein said cup member (1361) has an opening (1361a) allowing means for boring the bottom of the case (1;101) to pass through.

45. A [[M]]machine according to Claim 38, ~~characterized in that~~ wherein said boring punch (1350) comprises a tip (1353) integral with the top end of a column (1352).

46. A [[M]]machine according to Claim 38, ~~characterized in that~~ wherein said boring punch (1352) comprises an annular surface (1370) arranged coaxially with the said punch and at a suitable axial distance from the boring tip (1353), the said annular surface being provided with reliefs (1371,1372) for engraving the bottom of the case (1;101).

47. A [[M]]machine according to Claim 46, ~~characterized in that~~ wherein the forming punch (1240) envisages a free surface associated with a surface (1270) on which recesses (1271,1272) corresponding to reliefs on the annular engraving surface are formed.

48. A [[M]]machine according to Claim 25, ~~characterized in that~~ wherein it comprises an element (1310) for axially closing the seat housing the said boring means (1350).

49. A [[M]]machine according to Claim 25, ~~characterized in that~~ wherein said case [[101]] has a pre-printed surface.

50. A [[M]]method for forming a cartridge case (1;101) from a sheet, ~~characterized in that~~ wherein it comprises the following steps:

- e) supplying a sheet of metal [[10]] to a forming machine [[20]];

f) forming shaping and boring the case (1;101) in a single stage by three coaxial movements of a forming die set;

g) extraction of the formed and bored case (1;101).

51. A [[M]]method according to Claim 50, ~~characterized in that~~ wherein said metal sheet [(10)] is cut to a predefined size.

52. A [[M]]method according to Claim 50, ~~characterized in that~~ wherein said forming operation is a drawing operation.

53. A [[M]]method according to Claim 50, ~~characterized in that~~ wherein said forming and boring operations are performed.

54. A [[M]]method according to Claim 50, ~~characterized in that~~ wherein the case obtained (1;101) has a substantially constant thickness along the side surface and bottom.

55. A [[M]]method according to Claim 50, ~~characterized in that~~ wherein it comprises a further step for widening the bottom (1b) of the case (1;101).

56. A [[M]]method according to Claim 50, ~~characterized in that~~ wherein it comprises a further step for printing the bottom (1b) and/or the external side surface of the case (1;101).

57. A [[M]]method according to Claim 56, ~~characterized in that~~ wherein said further printing step is performed in-line.

58. A [[M]]method according to Claim 56, ~~characterized in that~~ wherein said further printing step consists in tampography, serigraphy or printing with an electronic pen.

59. A [[M]]method according to Claim 50, ~~characterized in that~~ wherein the material used for forming the case is steel.

60. A [[M]]method according to Claim 59, ~~characterized in that~~ wherein the said material is preferably steel lined electrolytically and/or suitable for combination with a film of metal such as brass, stainless steel, zinc, aluminium, titanium, copper and/or plastic.

61. A [[M]]method according to Claim 59, ~~characterized in that~~ wherein said material is preferably steel lined with tin.

62. A [[M]]method according to Claim 59, ~~characterized in that~~ wherein the case (1;101) comprises a further step for painting the cut edges.

63. A [[M]]method according to Claim 61, ~~characterized in that~~ wherein said painting is performed by means of electrophoresis.

64. A [[M]]method according to Claim 50, ~~characterized in that~~ wherein said material is preferably aluminium [sic] and alloys thereof.

65. A [[M]]method according to Claim 50, ~~characterized in that~~ wherein it comprises the following steps) [sic] downstream of the step for cutting the sheet [[10]] and upstream of the step for forming the case (1;101):

- b) lithographic printing of a surface of the sheet [[10]]; [sic]
- c) varnishing the printed sheet [[10]] with a layer of protective varnish;
- d) polymerization of the print and the varnish.

66. A [[M]]method according to Claim 65, ~~characterized in that~~ wherein the protective varnish applied to the print is of the polyester, epoxy ureic, polyurethane, epoxide type containing zirconium or water.

67. A [[M]]method according to Claim 65, ~~characterized in that~~ wherein polymerization of the print and the varnish is performed using hot air.

68. A [[M]]method according to Claim 67, ~~characterized in that~~ wherein the temperature of the hot-air oven is kept between 180° and 220°C.

69. A [[M]]method according to Claim 68, ~~characterized in that~~ wherein the temperature of the hot-air oven is preferably kept between 195° and 205°C.

70. A [[M]]method according to Claim 65, ~~characterized in that~~ wherein polymerization of the print and the varnish is performed using UV rays.

71. A [[M]]method according to Claim 50 [[or 65]], ~~characterized in that~~ wherein it envisages a step involving engraving of the bottom of the case during boring thereof.